

Solutions Quiz (Chapter 6/7)

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Part B: Short Answer (20 marks)

Answer the questions in the space provided.

1. TSP is an all purpose cleaner that can be used to clean driveways. What volume of solution would you get if you dissolved 150.0 g of sodium phosphate in water to produce a 0.23 mol/L solution? (5 marks)

$$M = 150.0g, M_{Na_3PO_4} = 163.94 \text{ mol/L} \quad (1)$$

$$n = 150.0g \times \frac{1 \text{ mol}}{163.94g} \quad (2)$$

$$= m/M = 0.915 \text{ mol} \quad (3)$$

$$C = \frac{n}{V} \Rightarrow V = \frac{n}{C} = \frac{0.915 \text{ mol}}{0.23 \text{ mol/L}} = 3.98L$$

$$\quad (4) \quad \quad \quad = 4.0L \quad (5)$$

2. How much water must be added to 200mL of a 2.40 mol/L $\text{NH}_3(\text{aq})$ cleaning solution to make the concentration of the resulting solution 0.48 mol/L?

$$C_1 = 2.40 \text{ mol/L} \quad C_2 = 0.48 \text{ mol/L}$$

$$V_1 = 200 \text{ mL} \quad ? V_2 \rightarrow \text{then added } V$$

$$C_1 V_1 = C_2 V_2$$

$$(1) \quad V_2 = \frac{C_1 V_1}{C_2}$$

$$= \frac{(2.40 \text{ mol/L})(200 \text{ mL})}{0.48 \text{ mol/L}} \quad (2)$$

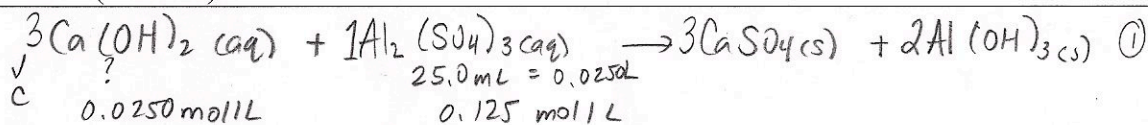
$$= 1000 \text{ mL} \quad (3)$$

$$\text{Volume that needs to be added} =$$

$$V_2 - V_1 = 1000 \text{ mL} - 200 \text{ mL} = 800 \text{ mL} \quad (4)$$

-0.5 S.F.

3. Calculate the volume of 0.0250 mol/L calcium hydroxide solution that can be completely reacted with 25.0 mL of 0.125 mol/L aluminum sulfate solution. (6 marks)



$$\begin{aligned} n_{\text{Al}_2(\text{SO}_4)_3} &= C \times V \quad (2) \\ &= (0.0250 \text{ L})(0.125 \text{ mol/L}) \\ &= 3.125 \times 10^{-3} \text{ mol Al}_2(\text{SO}_4)_3 \quad (3) \end{aligned}$$

$$n_{\text{Ca(OH)}_2} = 3,125 \times 10^{-3} \text{ mol Al}_2(\text{SO}_4)_3 \times \frac{3 \text{ mol Ca(OH)}_2}{1 \text{ mol Al}_2(\text{SO}_4)_3} = 9,375 \times 10^{-3} \text{ mol Ca(OH)}_2 \quad (4)$$

$$V_{\text{(a(OH)}_2)} = \frac{n}{C} = \frac{9.375 \times 10^{-3} \text{ mol}}{0.0250 \text{ mol/L}} = 0.375 \text{ L}$$

$$\textcircled{5} = 0.375 \text{ L} \textcircled{6}$$

4. An aqueous solution of sodium phosphate mixes with an aqueous solution of lead (II) nitrate. Write the balanced chemical equation, the total ionic equation, and the net ionic equation for this reaction. (6 marks-2 marks for each equation)

